REMARKS

Claim 1 has been amended to emphasize that, according to the present invention, a stoichiometric composition exists, wherein the number of atoms Zn+Cu+A+B is equal to the number of atoms S+Se+Te (i.e., Zn+Cu+A+B = S+Se+Te). Support for the amendment to Claim 1 is found, for example, in the working examples and Table 1 of the present specification. Entry of this Amendment is respectfully requested. Claims 1-28 are pending.

Response to Claims Rejection Under § 103

Claims 1-28 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Dimitrova et al (V. Dimitrova, J. Tate, Synthesis and characterization of some ZnS-based thin film phosphors for electroluminescent device applications, Thin Solid Films 365 (2000) pages 134-138, hereinafter "Dimitrova").

Applicants traverse, and respectfully request the Examiner to reconsider for the following reasons.

I. Polarity:

Regarding polarity, the present inventors discovered that a semiconductor material comprising ZnSe and Cu of 5% forms a p-type semiconductor material, which of itself is a point of novelty aside from the claimed invention, and where it is known that an activation rate of Cl is higher than that of Cu.

Dimitrova relates to "phosphors consisting of a material represented by $ZnS{:}CuCl_2$." Although Dimitrova discloses the presence of both of Cu and Cl in the phosphor material, Dimitrova does not disclose or suggest that the phosphors have semiconductor properties.

Namely, Dimitrova merely discloses a "phosphor." Further, assuming *arguendo* that the phosphors of Dimitrova have some kind of semiconductor property, one cannot presume whether the phosphor exhibits p-type or n-type properties.

The Examiner takes the position that (1) Dimitrova describes ZnS used as a phosphor thin film for an electroluminescent device (Introduction, paragraph 1), and it is very well known in the art that ZnS as used as a phosphor film in an electroluminescent device has semiconductive properties, and that ZnS in general is well known as a semiconductive material; and (2) the amounts of Cu and CI as used in the $ZnS:CuCI_2$ material of Dimitrova inherently create a p-type semiconductive device due to the respective amounts and dopant activity.

As the Examiner is aware, in accordance with MPEP 2112 IV, the fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. *In re Rijckaert,* 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993). Further, in relying upon the theory of inherency, the Examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic <u>necessarily</u> flows from the teachings of the applied prior art. *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990).

In view of the foregoing, Applicants respectfully request that the Examiner provide objective support for (1) the Examiner's presumption that the phosphor of Dimitrova has semiconductive properties, and (2) the presumption that the [$ZnS;CuC1_2$] is inherently a p-type semiconductive device, which inherency <u>necessarily</u> flows from the teachings of Dimitrova. Absent objective support, the Examiner appears to be using improper hindsight in finding that

the phosphors of Dimitrova (1) have semiconductor properties, and (2) are p-type semiconductors. That is, the Examiner could not have arrived at such conclusion in the absence of Applicants' teachings in the specification.

II. Composition:

Regarding composition, according to the present invention, and as recited in present Claim 1, a stoichiometric composition satisfies the relationship wherein "the number of atoms Zn+Cu+A+B is equal to the number of atoms S+Se+Te (i.e., Zn+Cu+A+B = S+Se+Te)." Further, in the case where $\beta=\gamma=x=y=0$, a Zn site of ZnS is replaced by Cu. That is, Cu doping is utilized so as to maintain the stoichiometric composition, which is an essential configuration of the present invention. In this regard, Applicants submit that that the presently claimed stoichiometric composition would be apparent one skilled in the art, upon reading the present specification as a whole and, in particular, the Working Examples and Table 1.

In contrast, Cu doping, according to Dimitrova, is not utilized to maintain the stoichiometric composition, since such a composition is not an essential feature of Dimitrova. Rather, Cl is an essential component of the phosphor of Dimitrova, such that the Cu level is formed on the top of the valence band and the Cl level is formed on the top of the conductor, thereby generating light corresponding to a difference between the two levels.

According to the present invention, Cl is not an essential component. Thus, in the case where Cl is included in the presently claimed composition, as in Claim 5, constituent elements of Claim 1 (i.e., Zn, Cu, A, B, S, Se and Te) satisfy the stoichiometric composition and Cl serves as an additional dopant added to the constituent elements. Accordingly, the composition of the

presently claimed material differs from that of the thin film composition of Dimitrova in that Dimitrova does not satisfy the presently claimed stoichiometric composition.

III. **Object and Function**:

As described above, a feature of the present invention is that the constituent elements "Zn, Cu, A, B, S, Se and Te" satisfy the term of which "the number of atoms Zn+Cu+A+B is equal to the number of atoms S+Se+Te." This configuration differs from Dimitrova.

In addition, according to the present invention, the presently claimed semiconductor material makes it is possible to regulate the resistivity by using a compensation dopant, Cl, (a compensator) in addition to a Cu doping amount. In other words, in cases where it is difficult to control the density of the electron hole merely by changing the Cu concentration, it is possible to precisely control the carrier concentration by doping a compensation dopant such as Cl. *See,* paragraphs [0020] and [0021].

In contrast, the method of doping Cl according to Dimitrova is a method typically used for a phosphor material. In particular, Dimitrova discloses that, in the case of $ZnS:CuCl_2$, Cu and Cl are co-activators. Accordingly, Dimitrova fails to disclose or suggest a method of precisely controlling the carrier concentration.

Withdrawal of the foregoing rejection under 35 U.S.C. § 103(a) is respectfully requested.

Applicants further advise of certain inadvertent, clerical errors as follows. In Table 1 at page 33 of the specification, Zn (at%) for Example 3 should be ~~46~~ 48. Se (at%) for Example 2 should be ~~60~~ 50. Cu (at%) for Example 4 should be ~~5~~ 6. In Table 2 at page 35 of the specification, Se (at%) for Example 7 should be ~~60~~ 50. Applicants became aware of these

clerical mistakes during foreign prosecution of a corresponding application, and offer to make the above-noted corrections at an appropriate stage of prosecution.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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